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| 10/521,533      | 11/07/2005  | Er'el Granot         | 040990/287233       | 8786             |

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| EXAMINER |
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SLOMSKI, REBECCA

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| ART UNIT | PAPER NUMBER |
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2877

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12/13/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                |                               |  |
|------------------------------|--------------------------------|-------------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>10/521,533  | Applicant(s)<br>GRANOT ET AL. |  |
|                              | Examiner<br>Rebecca C. Slomski | Art Unit<br>2877              |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 November 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 January 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>11/07/05</u> .  | 6) <input type="checkbox"/> Other: _____                          |

DETAILED ACTION

*Priority*

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

*Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 17, 18 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

2. With respect to claim 1, the limitation "said light comprises spectral frequencies which make up the Fourier transform of said short pulse to be emulated" in lines 4-6 is unclear.

Additionally, there is insufficient antecedent basis for the limitation "said short pulse to be emulated" in the claim.

3. With respect to claims 17 and 18, the limitation "said object or objects embedded in the an optically turbid medium" in line 2 of the claims lacks antecedent basis. Additionally, it is unclear whether the "optically turbid medium" stated in these claims corresponds with the "medium" of claim 1. Word designations should remain consistent throughout the claims.

4. With respect to claim 19, the limitations are incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the tunable laser, an RF oscillator, modulating means, detecting means, an optically scattering medium, electronic processing means, and optional optical elements means. The claim is simply a list of components and give no structural limitations for the relationship between them.

5. With respect to claim 19, the limitation "optional optical elements means" being indefinite in that it fails to point out what is included or excluded by the claim language. This claim is an omnibus type claim.

*Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 4, 12, 13, 14, 15, 17, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Arons and Dilworth "Analysis of Fourier synthesis holography for imaging through scattering materials".

6. With respect to claim 1, Arons and Dilworth disclose a method of imaging scattering materials comprising:

- Send light through a medium, wherein said light comprises spectral frequencies which make up the Fourier transform of said short pulse to be emulated (page 1984, left column, lines 10-13)
- Detecting spectral components of said light exiting said medium (page 1842, left column, line 13-14)
- Determining the relative amplitude and phase change of each of said spectral components with respect to that of said illuminating light source (page 1842, right column, lines 1-2, Equation 5, lines 16-26, wherein  $h(t)$  = amplitude and stretched output pulse (phase changed))
- Obtaining from said relative amplitude and phase change the spectral response of said medium (page 1842, Equation 4)
- Computationally performing an inverse Fourier transform on said spectral response (page 1842, right column, lines 17-18, wherein it is inherent that in order to get from frequency domain  $H(f)$  to time domain  $h(t)$  an inverse Fourier transform)

- Obtaining the temporal response on said medium to said emulated short pulse from said inverse Fourier transform (page 1842, right column, Equation 5,  $I(\Delta t) =$  temporal response)

7. With respect to claim 2 Arons and Dilworth discloses all of the limitations as applied to claim 1 above. In addition, Arons and Dilworth discloses:

- The light is a CW (page 1842, left column, lines 10-13, wherein instead of pulses wavelength components = continuous waves)

8. With respect to claim 4, Arons and Dilworth discloses all of the limitations as applied to claim 1 above. In addition, Arons and Dilworth discloses:

- The light comprises substantially all of the spectral frequencies which make up the Fourier transform of the short pulse to be emulated (Figure 6)

9. With respect to claim 12, Arons and Dilworth discloses all of the limitations as applied to claim 1 above. In addition, Arons and Dilworth discloses:

- At least one object is embedded within the medium (page 1841, left column, lines 3-10)

10. With respect to claims 13 and 14, Arons and Dilworth discloses all of the limitations as applied to claims 1 and 12 above. In addition, Arons and Dilworth discloses:

- At least one object is detected/imaged (page 1841, left column, lines 3-23, Figure 5)

11. With respect to claim 15, Arons and Dilworth discloses all of the limitations as applied to claims 1 and 12 above. In addition, Arons and Dilworth discloses:

- At least one object comprises a cancerous growth and the medium comprises a segment of the human body (page 1841, left column, lines 8-10)

12. With respect to claims 17 and 18, Arons and Dilworth discloses all of the limitations as applied to claim 1 above. In addition, Arons and Dilworth discloses:

- The “first light” response/specific segment of the temporal response which is indicative of the position and shape of said object or objects embedded in an optically turbid medium and/or obstructed by other objects, which are at least partially transparent, is determined from the optical temporal response (Figure 5(b), page 1845, left column, lines 38-45)

Claims 1, 3, 5, 6, 7, 8, 9, 12, and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Naganuma U.S. Patent #6,456,380.

13. With respect to claim 1, Naganuma discloses a method for measuring waveform of optical signals comprising:

- Send light through a medium, wherein said light comprises spectral frequencies which make up the Fourier transform of said short pulse to be emulated (Col.15, L 21-26 and L 44-55)

- Detecting spectral components of said light exiting said medium (Col.15, L 57-60)
- Determining the relative amplitude and phase change of each of said spectral components with respect to that of said illuminating light source (Col.19, L 35-46, Equation 14, amplitude = gain coefficient  $g_0$  in Equation 15, phase change =  $\Delta k$  in Equation 15)
- Obtaining from said relative amplitude and phase change the spectral response of said medium (Col.19, L 35-40, power spectrum  $S(v)$ , Equation 14)
- Computationally performing an inverse Fourier transform on said spectral response (Col.23, L 37-41)
- Obtaining the temporal response on said medium to said emulated short pulse from said inverse Fourier transform (Col.23, L 37-41, Figure 9)

14. With respect to claim 3, Naganuma discloses all of the limitations as applied to claim 1 above. In addition, Naganuma discloses:

- The light is modulated (Col.31, L 16-18)

15. With respect to claim 5, Naganuma discloses all of the limitations as applied to claim 1 above. In addition, Naganuma discloses:

- The light comprises substantially less than all of the spectral frequencies which make up the Fourier transform of the short pulse to be emulated (Col.15, L 44-45, comprises only the second harmonic)



16. With respect to claim 6, Naganuma discloses all of the limitations as applied to claim 1 above. In addition, Naganuma discloses:

- The light has a carrier frequency which is scanned over time, and the relative amplitude and phase change are determined for each carrier frequency (Col.22, L 50-64, while varying the degenerate frequency,  $S(v)$  is recalculated, including  $g_0$  and  $\Delta k$ )

17. With respect to claim 7, Naganuma discloses all of the limitations as applied to claim 1 above. In addition, Naganuma discloses:

- The light consists of a broad spectral bandwidth and each of the spectral components of the output of said light exiting the medium are detected (Col.13, L 63-65, Col.17, L 29-38)

18. With respect to claim 8, Naganuma discloses all of the limitations as applied to claim 1 above. In addition, Naganuma discloses:

- The light is detected either at a point, along a line, or over a two-dimensional area (Col.11, L 10-18, either point with photo-detector or line with linear detector array)

19. With respect to claim 9, Naganuma discloses all of the limitations as applied to claim 1 above. In addition, Naganuma discloses:

- The light transmitted through the medium is detected (Figure 1, medium 113, detector 115)

20. With respect to claim 12, Naganuma discloses all of the limitations as applied to claim 1 above. In addition, Naganuma discloses:

- At least one object is embedded within the medium (Col.5, L 20-24, Col.7, L 4-8, crystal of periodic structure in the medium)

21. With respect to claim 16, Naganuma discloses all of the limitations as applied to claim 1 above. In addition, Naganuma discloses:

- The medium comprises discrete layers (Col.5, L 20-25, L 36-41)

Claim 19 is rejected under 35 U.S.C. 102(e) as being anticipated by Zhang and Lilge "Frequency-domain near infrared spectroscopy instrumentation".

22. With respect to claim 19, Zhang and Lilge disclose an apparatus for spectroscopy comprising:

- A tunable laser (Figure 1, page 251, right column, paragraph 3)
- An RF oscillator (Figure 1, RF lock-in and Amp)
- modulating means (Figure 1, Biad-T)
- detecting means (Figure 1, APD detector)
- an optically scattering medium (Figure 1, Sample)

- electronic processing means (Figure 1, Amp, page 252, left column, paragraph 2, computer)
- optional optical element means (Figure 1, fiber)

*Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Naganuma U.S. Patent #6,456,380 in view of Dixon et al. U.S. Patent #6,853,455.

23. With respect to claim 10, Naganuma discloses all of the limitations as applied to claim 1 above. However, Naganuma fails to disclose the light reflected back from the medium is detected.

Dixon et al. discloses a method for Fourier spectral analysis comprising:

- Light reflected back from the medium is detected (Figure 1c)

It would have been obvious to one of ordinary skill in the art at the time of the invention to detect reflected light of Naganuma since reflection and transmission are art recognized equivalents and solely depend on the design choice and type of sample being considered.

24. With respect to claim 11, Naganuma discloses all of the limitations as applied to claim 1 above. However, Naganuma fails to disclose the light which exits the medium at any angle with respect to the illumination path is detected.

Dixon et al. discloses a method for Fourier spectral analysis comprising:

- Light reflected back from the medium is detected (Figure 1c)

It would have been obvious to one of ordinary skill in the art at the time of the invention to detect reflected light of Naganuma in addition to transmitted light as in claim 9 since doing so would provide for a more thorough inspection of the sample, and save time in not having to repeat measurements at different angles.

#### Citation

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Rogers et al. U.S. Patent #5,734,470 discloses a device and method for time resolved optical measurements
- Tsuchiya U.S. Publication 2001/0038454 discloses methods and apparatus for measuring internal information of scattering mediums

*Conclusion*

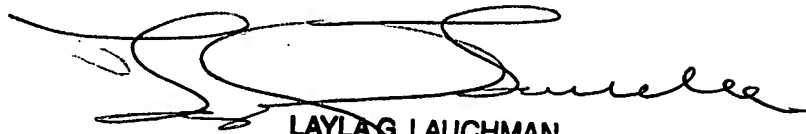
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rebecca C. Slomski whose telephone number is 571-272-9787. The examiner can normally be reached on Monday through Thursday, 7:30 am - 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on 571-272-2059. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Rebecca C. Slomski  
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LAYLA G. LAUCHMAN  
PRIMARY EXAMINER